

APPENDIX H

ROADNET EVALUATION

Road evaluation at any level is more than a review of the road network, surface treatments, and bridge capacities. It encompasses all aspects of logistics preparation of the battlefield (such as friendly and enemy activity, weather, and terrain). This appendix addresses factors that should be considered in evaluating a road network.

H-1. MAPS AND OTHER DATA. Movement planning begins by studying maps of the area that offer general alignment, comparative surfacing, and information on bridges and tunnels. If operations are to be sustained, add data from other sources such as the following:

- Topographic maps.
- Air photographs.
- Ground reconnaissance.
- Reports of travelers or inhabitants.
- Construction plans of highways and bridges.
- Engineers, military police, and movement control units.

H-2. ROAD CHARACTERISTICS. Road characteristics include elements of design and construction that influence vehicular travel, such as--

- *Turns.* Sharp hairpin turns, particularly in mountainous terrain, may restrict the use of some larger military vehicles.
- *Width of road.* Width determines the size of vehicles and number of traffic lanes that can be accommodated.
- *Type of road.* Engineers classify roads into three basic types:
 - Type X, all-weather.
 - Type Y, all-weather (limited traffic due to weather).
 - Type Z, fair weather.

Classification is based on the road's ability to withstand weather effects. It considers road surface material, type of construction, alignment, grades, and other features. Roads are type classified by the worst section.

a. **Military Load Classification.** Military load classification is a load capacity rating system that assesses the effects of vehicle weight and type upon roads and bridges. Road classification is based on the lowest bridge military load classification number for each road or route considered.

See FM 55-15 for steps in estimating highway tonnage capabilities under varied conditions. See FM 5-36 for information on road characteristics and classifications.

b. **Obstructions.** Obstructions are natural or manmade obstacles, or a combination of the two (including obstacles created by enemy action), that hinder or stop movement over a given section of road. Obstructions are critical points that include--

- Reductions in overhead clearance. Look for overhead wires, low overhanging tree branches, overpasses, underpasses, clearances, bridges, and tunnels.
- Reductions in road width. Look for narrow tunnels and bridges and overhanging or encroaching buildings.
- Reductions in road capacity. Look for bridges, fords, or ferries having less capacity than the road.
- Steep grades (7 percent or greater) and sharp curves (radius less than 30 meters).
- Weather restrictions, such as ice, snow, and mud slides. Fog and floods can hinder or stop traffic but should only be considered obstructions when they regularly obstruct roads.
- Contaminated or damaged areas.

H-3. CLIMATE, TERRAIN, AND WEATHER. Climate and terrain should be considered together. Their greatest effect is on off-road or cross-country motor movement operations. Terrain evaluation is the study of how soils, vegetation, climate, and land forms help or hinder the employment of military units and equipment. Road movement planners evaluate terrain to determine the ability to move vehicles and equipment without interruption and with minimum exposure to observation and direct fire.

Climate is a condition produced by temperature, humidity, precipitation, wind, and light in an area over an extended period. Climate influences long-range plans for an area of operations. Weather is the local, day-to-day condition of the atmosphere. Daily operations are concerned with weather.

Extremes of climate and weather impact motor operations by their effects on personnel and equipment. Cold climates reduce the efficiency of personnel. Bulky clothing limits movement in performing maintenance and operational duties. Hot, humid climates reduce energy and increase physical discomfort and the likelihood of disease. Over time, heat and high humidity reduce the life expectancy of all equipment and add to the problems of maintenance, repair, and replacement. Rust and corrosion are accelerated. Mildew and rot rapidly attack unprotected clothing and leather products.

Extremes of weather affect the daily maintenance and operation of motor vehicles. Low temperatures require protection of cooling systems to prevent freezing, fuel additives to prevent frozen fuel lines, and protection to make starting easier. Tire life may be reduced; metals may become brittle and break. Batteries lose efficiency and may freeze or crack. Severe freezing may require extensive road repairs after each thaw, particularly in early spring. Extremely high temperatures may increase the number of breakdowns from overheating.

H-4. TERRAIN EVALUATION. Terrain evaluation considers all factors of the operational environment in relation to the capabilities and limitations of the task equipment. In all military motor transport operations, terrain evaluation should be done for every new mission. The source of information, the techniques, and the results of terrain evaluation vary with the operational environment. See FM 55-15 to find how to evaluate terrain. Terrain evaluation at unit level is made to select the most suitable route to accomplish the mission most effectively under the circumstances.

It is based on information gained from observation and ground reconnaissance, aided and expanded by maps, photos, and local intelligence. Carefully weigh this information against known capabilities and limitations of the vehicles and the training or experience of the drivers. Weather, rather than climate, is the most important variable. Even in a well-developed area with a good roadnet, a driver may be required to make an off-road detour to bypass a roadblock or section of damaged highway. The habit of constant terrain evaluation enables him to make a quick decision and prompt selection of the most practical route.

H-5. COMBINED EFFECTS. Adverse conditions for motor vehicle operation and military motor movement are usually caused by combinations of terrain, climate, and weather. The effects of climate on terrain include:

- Amount of vegetation.
- Amount and frequency of precipitation.
- Average moisture content of soils.
- Size and type of water obstacles.

Weather conditions may reduce highway speeds, increase congestion, and be a major cause of accidents. Fog, rain, snow, ice, and high winds restrict movement on highways as well as travelling cross-country. In planning off-road movement and movement on unimproved roads and trails, consider the type and character of soils along with climate and weather. Vegetation may serve as an indicator of soil type and trafficability. It may also be an obstacle to movement even though it provides cover and concealment. Soils are made up of disintegrated rock in the form of sand or clay (structure) and disintegrated organic material (humus). Their capacity to support traffic depends on both structure and the amount of moisture present.

The condition of the soil is important when planning for off-road movement. The following briefly outlines major soil characteristics and the effects of climate and weather. Snow characteristics are also included since the effects of snow on motor movement are considered in the same manner as soil effects. Normal topsoil is a mixture of clay, silt, or sand and decomposed vegetation. Mud is clay and silt. All soils containing large amounts of these substances will become soft and pliable when wet. Silty soil becomes dusty and loose when dry. Clay soil dries hard and firm, making a good road surface. Rain has little effect on silty soil but may make clay roads greasy, reducing trafficability.

a. **Sand.** Fine sand gives excellent support and traction when firmly compacted and dampened. Coarse sand does not compact well. It dries rapidly and is an obstacle to motor movement.

b. **Snow.** The effects of snow are unpredictable and vary with temperature changes. Trafficability in snow depends on its strength, traction, and resistance. Light, new-fallen snow up to 20 inches (50 centimeters) deep may offer no serious obstacle to the average military vehicle. However, 8 inches of grainy, sandlike “sugar snow” may make wheeled vehicle operations impossible. In extreme cold, snow has the same traction as dry soil. Near- or slightly above-freezing temperatures drastically reduce traction on hard-packed snow surfaces.